1854MNRAS..15...69D

"2°. The effect of refraction is eliminated.

"3°. The method is independent of the unavoidable errors which the observation of zenith-distances entails upon the reading off of the vertical circle. It is also independent of the errors of the instrument, as well as those of the micrometer screws, and of the error of collimation.

"4°. The observation may be repeated several times."

The following process was employed for deducing the longitude from the observations:—

With an assumed longitude ($7^h\ 7^m\ 37^s$ East) the Greenwich mean time of the observation of the moon's limb was found, and the corresponding right ascension and declination of the moon calculated from the *Nautical Almanac.*

From these data the zenith-distance of the moon's centre was finally calculated, which, if the assumed longitude was correct, ought to agree with the observed zenith-distance. If no such agreement was found to subsist, the difference of the two quantities served to indicate the difference of longitude which would result by repeating the calculation with a longitude greater or less by 10^s than the longitude assumed. The author remarks that the agreement of the results obtained in the same night by this method leaves nothing to be desired, and that the probable error of an observed zenith-distance does not amount to more than $1''\cdot3$, which on an average agrees with an error of $2^s\cdot6$ in the longitude deduced from it, a degree of accuracy, he adds, which is not to be obtained by any other method with so small instruments.

The results of the observations are then given. The longitude for each observed zenith-distance is computed, and also the small difference which would result if the assumed longitude were increased by 10^s. The transit-observations next follow with the individual values of the longitude deduced from them. The Paper concludes with the equations of condition for the correction of the longitude based upon a few observed occultations. The method of calculation employed is that given by Professor Challis in the *Nautical Almanac* for 1854.

Telescopic Appearance of the Planet Venus at the time of her Inferior Conjunction, February $28^d\ 1^h\ 45^m$, 1854. By John Drew, Ph. D.

"Having ascertained from the *Nautical Almanac* that on this occasion the heliocentric latitude of *Venus* was nearly at its maximum, I determined to watch her if possible at the time of conjunction; and, as the sky was particularly clear, I succeeded in taking observations of the planet both before and after the occurrence.

"Measurement with the position wire micrometer gave, as nearly as it would admit, $3''$ as the breadth of the illumination: more than half of her circumference was visible, but its extent I

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regret that I did not ascertain. On a similar occasion (May 1849) the distance from one cusp to the other was found by M. Mädler, making use of the Dorpat refractor, to be no less than 240° (*Astronomische Nachrichten*, No. 679), whence he deduces 43′ 7″ as the amount of horizontal refraction in *Venus*, or greater than that of our atmosphere by about one-sixth.

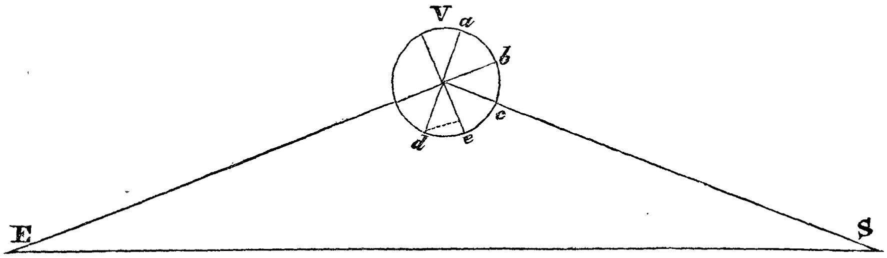
"With the object of ascertaining how much of the breadth of the crescent was due to refraction, I calculated the breadth of that portion of her surface which only would be visible, supposing the planet was not surrounded by an atmosphere, and found it to be 0″·67. The difference between this and 3″ is, I apprehend, caused by the refraction of the planet's atmosphere.

"I subjoin the calculation and a drawing of the appearance of the planet at the instant of her inferior conjunction.

	°	′	″
Heliocentric latitude of Venus	3	22	32
Geocentric latitude	8	48	10
Illuminated portion = the sum	12	10	42

"The versed sine of this last quantity is ·0225: hence ·01125 of her diameter (59″·6) = 0″·67 will be the breadth at the widest part of the illuminated crescent.

"The observations were taken at my observatory, Southampton, with a 5-foot refractor by Dollond.



"Let V be *Venus;* E the Earth; S the Sun; *ad* the boundary of light and darkness; *de* the illuminated portion, as seen from E = *bc*; but *bc* = ∠E + ∠S = geocentric lat. + heliocentric lat."

Contribution to the Theory of Elliptic Functions. By Carl John Malmsten, Professor of Mathematics in the University of Uppsala.*

In this paper the author gives a new demonstration of the three well-known relations connecting the elliptic function of the third order

$$\Pi(n, k, \phi) = \int_0^\phi \frac{d\phi}{(1 + n \sin^2 \phi)\, \Delta(k, \phi)}$$

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* Communicated by A. D. Wackerbarth, Esq.

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